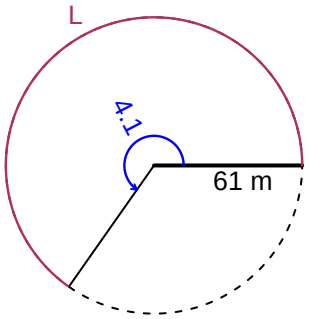
Name: Date:

Trig Final (Solution v18)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 4.1 radians. The radius is 61 meters. How long is the arc in meters?

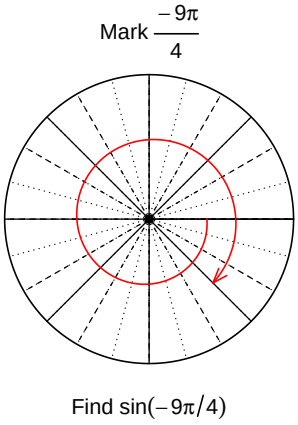


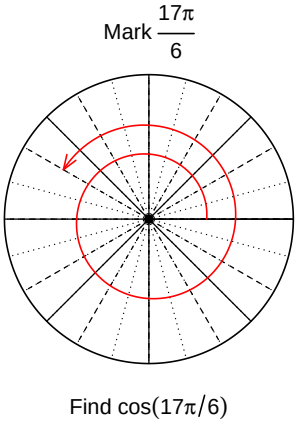
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 250.1$ meters.

Question 2

Consider angles $\frac{-9\pi}{4}$ and $\frac{17\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-9\pi}{4}\right)$ and $\cos\left(\frac{17\pi}{6}\right)$ by using a unit circle (provided separately).





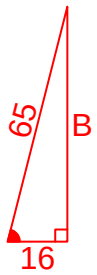
$\sin(-9\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(17\pi/6) = \frac{-\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-16}{65}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

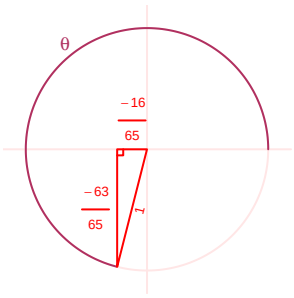
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$16^2 + B^2 = 65^2$$
$$B = \sqrt{65^2 - 16^2}$$
$$B = 63$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-63}{65}}{\frac{-16}{65}} = \frac{63}{16}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 2.67 meters, a frequency of 6.87 Hz, and a midline at $y = -5.62$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.67\sin(2\pi 6.87t) - 5.62$$

or

$$y = 2.67\sin(13.74\pi t) - 5.62$$

or

$$y = 2.67\sin(43.17t) - 5.62$$